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ABSTRACT

This longitudinal study investigated the relationship of stress arising from medical problems of newborns to parent-infant interaction through the infant's first year. Significant interactive differences between full term and premature infants were found in feeding situations during the neonatal period and in floor play at eight months. The sample of 40 parent-infant dyads was divided equally among full term, healthy preterm, and sick preterm infants, and infants of diabetic mothers. Each dyad was observed eight times (in hospital, home, and laboratory settings). On the hypothesis that medical problems would create stress leading to interactive difficulties, it was predicted that full term infants would have the fewest interactive problems and there would be increasing problems for healthy preterm infants, sick preterm infants, and infants of diabetic mothers, respectively. The Bayley Scales of Infant Development and the Brazelton Neonatal Assessment Scale were used to gauge infant behavior and interaction with parents and strangers, the experimenters. With the exception of the infants of diabetic mothers group, whose ordering was inconsistent, the relative position of the groups on each measure was consistent with the hypothesized continuum. In feeding situations, there were significant differences during the neonatal period which diminished at four months. In the 15-minute floor play sessions, there were significant group differences at eight months, diminishing at 12 months. The see-saw pattern of increasing and decreasing differences among the groups, and alternative interpretations of this pattern are discussed. It is suggested that the group differences indicate that it may be more difficult to care for preterm infants than full term infants. (Author/BH)

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Feeding, Fussing and Play: Parent-Infant Interaction in the First Year as a Function of Early Medical Problems

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I. Introduction

In early studies of the development of infants born prematurely, it was assumed that the sequelae of prematurity were confined to the infant alone. Thus, followup assessments were directed toward evaluation of the physical and cognitive development of the child and sometimes his/her emotional adjustment. Furthermore, it was assumed that, like most other children, the preterm infant was likely to develop best in a supportive environment and less well or poorly in an inadequate one. Hence followups might also include relatively global assessments of the environment as potential influences on the infant's development. The infant and the environment (including caregivers) were envisioned as independent entities with the latter having important influences on the former.

More recently, the significance of the caregiving environment as a predictor of subsequent development in the preterm infant has been underscored. In a 1975 review, Sameroff and Chandler concluded that the caregiving environment was a more potent predictor of developmental outcomes than early medical events or assessments. A recent comprehensive study of a large sample of preterm infants (Sigman & Parmelee, in press) indicated that measures of the infant-caregiver relationship were essential for differentiating infants continuing at risk from those developing normally. Thus, one important reason for studying patterns of interaction in families with preterm infants is that it holds vital clues to understanding the sequelae of prematurity and making long term predictions about development.

Those studies which have made systematic comparisons between patterns of interaction in full term and preterm dyads have reported consistent group differences in the developing parent-infant relationship (see Goldberg, (in press[3]) for a review of these studies). At hospital discharge, preterm

infants are found to be less alert and responsive and less well organized both motorically and in modulating states of arousal than their full term counterparts (DiVitto & Goldberg, in press; Field, 1977). Initially, parents of preterm infants appear to be less actively involved with their infants than parents of full term babies. They made less body contact with their infants (DiVitto & Goldberg, in press; Klaus, Kennell, Plumb & Zuelke, 1970; Leifer, Leiderman, Barnett & Williams, 1972), spent less time face to face (Klaus et al, 1970), smiled at their infants less (Leifer et al, 1972), touched them less (DiVitto & Goldberg, in press; Klaus et al, 1970, Leifer et al, 1972) and talked to them less (DiVitto & Goldberg, in press). Observations of older infants and their parents report that parents are more actively involved with infants who have had more medical problems (Beckwith & Cohen, in press) and that while parents exert more effort in interacting with their preterm infants, their babies engage less readily and actively in the task at hand (Brown & Bakeman, in press; Field, 1977). These studies seem to indicate that the parent-infant relationship may follow a different course of development in preterm as compared with full term dyads.

Under normal conditions, the behavioral repertoires of young infants and their parents appear to be well adapted for the development of harmonious reciprocal interactions (Goldberg, 1977; Stern, 1974, 1977). In contrast, the preterm infant who is less well adapted, (as evidenced by immaturity associated with poorer organization and lowered responsiveness) makes unusual demands on caregiving abilities. Parents of such infants may need to make unusual adaptations or require more time to establish a satisfactory relationship. Hence, it is not the baby alone who is affected by the event of premature birth. There are important consequences for the caregiving

environment as well. The infant and the environment constitute a system with reciprocally influential components. A disturbance or inadequacy in one part stresses the system and unless unusual resources are available to cope with such stress, it is likely that disturbance or inadequacy in other components will surface. Within this framework, it is not surprising to find that preterm infants are over-represented in reported cases of child abuse and failure to thrive (Elmer & Gregg, 1967; Klein & Stern, 1971; Shaheen, Alexander, Truskovsky & Barbero, 1968; Jameson et al, this volume). While the vast majority of parents and their preterm infants do make successful adjustments, the risk of interactive difficulties in this group is relatively high. Thus, it is likely that description of the ways in which preterm and full term dyads differ can provide clues to the etiology of interactive disturbances.

With this in mind, we began a longitudinal study of parent-infant interaction in the first year in families presumed to differ in risk for interactive difficulty as a consequence of neonatal medical problems. Unlike prior studies which simply compared full term and pre-term groups, we divided preterm infants into groups according to the seriousness of their medical problems, thus selecting groups from points along a continuum rather than a dichotomy. Furthermore, our sample was predominantly a white middle class sample with good medical care in a hospital with extensive supports for early parent-infant interaction. Hence, they represent a relatively advantaged portion of the preterm population. Many of the confounding factors usually associated with prematurity are absent in this group and cannot account for observed group differences. Subsequent administration of the HOME inventory revealed no group differences in this respect. Each dyad in our study was observed 8 times in the course of the infant's first year, thus providing more extensive longitudinal data than have previously been available

in other samples. Four of these assessments were scheduled in the second half of the first year where data from prior studies are especially sparse (Goldberg, in press[a]). Detailed presentation of the data for each age period have been presented and discussed elsewhere (DiVitto & Goldberg, in press; Brachfeld & Goldberg, 1978). In this chapter we wish to present an overview of the group comparisons made over the first year of life, indicating at what ages and in which situations there were or were not differences between our groups. There seems to be an informal consensus which holds that interactive differences between full term and preterm dyads gradually diminish and disappear over the first year. Our data, however, do not support this view unequivocally. Therefore part of this chapter will be devoted to alternative interpretations and explanations of the data, as they relate to the development of parent-infant relationships. In addition, to provide some perspective on the infant's behavioral contribution and the adult's view of it, we will present data on infant-experimenter interaction during assessment procedures.

II. Procedures and Findings

Four groups of infants were selected for study. The criteria for making this selection were based on the asumption that the more severe the infant's medical problems at birth, the more stressful the initial experiences of both infant and parents would be, hence the more interactive difficulties were expected. Thus, the continuum along which the groups were selected was one of increasing medical complications, and increasing risks for subsequent developmental problems.

Ten first-born infants from intact families were selected in each of four groups: full term healthy infants (FT), healthy preterm infants (HP), sick (respiratory distress) preterm infants (SP) and preterm infants born to

diabetic mothers (IDM). The IDM group was selected as a group that is considered to be highly vulnerable to complications of prematurity and subsequent problems. In addition, nurses had described these babies as behaviorally unresponsive. They were expected, therefore, to be similar to the sick preterm group with the added complication of a mother in poor health. Table 1 summarizes some characteristics of these four groups It can be seen that they differed systematically on most indicators of medical status. The full term infants were born at term and had no medical problems during a short hospital stay. The healthy preterm infants were born before 37 weeks gestation and had no medical problems other than those of gaining weight and maturing before discharge. Their hospital stays were longer than those of the full-term group. Infants in the sick preterm group were born earlier, weighed less and spent more time in the hospital than the healthy preterm group. Most of these infants required respiratory assistance and were tube fed for part of their hospital stay. The infants of diabetic mothers were the most heterogeneous group. Although they did not necessarily fall at the most extreme end of the continuum on most measures, their condition at birth was poorest.

The last column (morbidity index) in Table 1 represents an index of the infant's long term prognosis. It is a weighted score which takes account of obstetric and neonatal problems. The higher the score (i.e. the more, and the more serious the complications), the poorer the infant's prognosis. Much of the information used in calculating these scores (e.g. birth weight, gestational age) formed our criteria for selecting infants for the four groups. These scores generally confirm that the groups are comprised of infants who differed in risk for subsequent problems. In this respect, the IDM group does fall at one extreme of the

continuum, having the poorest prognosis.

Families were enrolled in the study before the infant was discharged from the hospital. Insofar as possible we tried to ensure that the groups had similar distributions with respect to sex of infant, initial feeding method, and socioeconomic status. (A more detailed description of the recruiting procedures and the problems encountered can be found in DiVitto & Goldberg (in press) and Goldberg (in press[b])). In every case where the duration of the infant's hospital stay exceeded that of the mother, the infant had been visited daily by one or both parents. Thus, although our preterm infants were initially separated from their parents more often and for longer periods of time than the full term group, they had more early contacts than the preterm infants studied in previous research projects.

Assessments on the Bayley Scales over the course of the first year indicated that development of all infants was within normal range with correction for prematurity. However, from the parents' point of view, it is clear that those with preterm infants had to wait longer for the achievement of developmental milestones and felt that their babies were "slower" or "behind". At each laboratory visit, parents were asked during the pediatric interview and examination about the new skills their infant's had acquired. Table 2 shows the average postnatal age of achieving some developmental milestones as reported by parents. Insofar as possible, these were corroborated by examination and the reports were not always accurate. The figures in Table 2 therefore reflect the parents' impressions of the child's development rather than accurate data. From this standpoint one can see that parents in the preterm groups did have to wait longer than their full term counterparts to see positive signs of growth and development in their children. For example, in the early weeks and months, the younger and sicker the infant had been, the longer parents had to wait for

the first social smiles and their first full night of sleep. In fact, in the sick preterm and IDM groups some infants were still not sleeping through the night at one year of age. Thus, although we can consider all three of our preterm groups as developing within normal expectations, parents in these groups had to "put up with" immature and sometimes frustrating behavior (such as night waking) for a longer period of time than did parents of full term infants.

A. Parent Infant Interaction

Parent-infant interactions were assessed in two different situations. Each was chosen to represent a salient aspect of the parent-infant relationship at particular ages. In the early months (neonatal and 4-month assessments), feeding was chosen for its ubiquity as the context in which most early parent-infant interaction takes place in our culture. Home and laboratory visits were scheduled so that they would include a routine feeding. Feedings commenced whenever the parent judged that the infant needed to be fed and terminated when the parent judged that the feeding was over. Except for adjustments which had to be made in the relatively strange situation of the laboratory, parents were instructed to follow their usual feeding routine (e.g. with respect to the location, interruptions for burping and so on).

For the 8- and 12-month observations we chose floor play as more representative of the time parents spend with older infants. Whether in the home or the laboratory, we provided four age-appropriate toys and instructed the parents to behave in the way they would normally behave when the infant was playing (including play with the infant with or without the toys or not interacting). Unlike the feeding session which varied in length according to the parent's judgment, the play sessions were each 15

minutes in duration. In some cases where the infant became distressed and could not be comforted, play sessions were terminated before the 15 minutes had elapsed.

At each observation session two observers coded preselected parent and infant behaviors on a time-marked code sheet in 10-second blocks. For the feedings, the behaviors coded included whether the infant's eyes were open or closed, whether the infant was sucking or not and motor and vocal behaviors. For the parent, the observers coded the caregiving activity (feeding, burping, cleaning, play), the position in which the infant was held and motor, vocal and gaze behaviors. Reliabilities for behaviors which occurred relatively infrequently (e.g. parent smiles) ranged from .75 - .88 while those for more frequently coded behaviors such as holding and looking at the infant ranged from .94 - 1.00. During the play observation the observers coded infant manipulation of toys, the location and proximity of parent and infant, infant locomotion and vocalising, touching and gaze behaviors for both parent and infant. The reliabilities for these codes ranged from .83 - .98. Regardless of the reliabilities, coding sheets for the two observers were reconciled and the reconciled data were used in all analyses. The primary data to be discussed here are measures of the frequency of different parent and infant behaviors during an observation session. Since the feeding sessions varied in length, all frequencies were converted to proportions of the total time feeding. The play sessions were intended to be of uniform length and we were therefore able to use the raw frequency measures. In cases where the session was terminated prematurely, the data for the remaining minutes were prorated.

The analyses and findings are presented in detail in previous papers (DiVitto & Goldberg, in press; Brachfeld & Goldberg, 1978). The following

summary is designed to highlight the changing patterns of group differences from age to age.

1. Feedings

We predicted that during feedings the preterm groups would show less body and eye contact as well as more infant distress than the full term group and that the differences between the full term and preterm groups would increase as the assumed risk for interactive difficulties increased. That is, on each measure the groups would order themselves FT-HP-SP-IDM. The primary analyses were univariate analyses of variance with Groups (4) and Sessions (4) or Age (2) as factors.

a. Preliminary t-tests showed no significant differences attributable to sex of infant. The only differences attributable to feeding method were that breast fed babies spent more time sucking and were touched more than bottle fed babies during the first (hospital) feeding.

b. Parents in all four groups spent virtually all their time (88-100%) looking at the baby. Mutual regard was therefore controlled by the baby. There were no group differences in infant looking behavior.

c. The most striking difference concerned the way in which infants were held during feedings. The position of the baby was coded in three categories during actual feeding: Arms (cuddled close with the infant's entire body supported in the parent's arms), Lap (held at arm's length with the infant's body resting in the parent's lap and the head supported with a hand), and Lap/Arms (an intermediate position in which the infant's body rested on the parent's lap and the head and shoulder's were cradled in the parent's arm). At the first observed feeding, full term infants spent 25% of the time in the Arms compared to 21% for the

IDM group, 8% for the healthy preterms and 3% for the sick preterm group. At the other extreme, the sick preterm infants spent the most time in the Lap position (61%) followed by the IDM group (41%), the healthy preterm group (37%) and then the full term group (24%).

d. Over the four observed feedings, the time in the Arms and time on the Lap decreased so that babies were held more and more in the intermediate position regardless of group. However, the full term infants continued to spend the least time on the Lap. Furthermore, although both the healthy and sick preterm infants experienced an increase in time cuddled in the arms from the first to the second feeding, they never approached the amount of cuddling the full term infants experienced at the initial feeding.

e. At the first two feedings, the full term infants were touched and talked to more than infants in any of the preterm groups.

f. There were no group differences in fussing or crying except at the 4-month laboratory feeding when the infants of diabetic mothers fretted more than any other group.

g. From the newborn to the 4-month observations, the group differences diminished. Although the same pattern of differences in holding, talking, and touching were evident in the data for each observation, they did not diverge enough to yield statistically significant differences in the 4-month period.

h. In addition interactive behaviors during feedings were systematically related to behavior assessed in the neonatal period using the Brazelton Neonatal Behavior Assessment Scales. Infants who had been alert and responsive during the neonatal exam were more likely to be alert, to look at their parents, and to be cuddled in the arms. Infants who had

been difficult to rouse and were likely to receive a high level of functional stimulation during feedings while those who were unresponsive to auditory stimulation received more auditory and tactile stimulation during feedings than more responsive babies.

The group differences observed during the feedings were generally consistent with our predictions. With the exception of the IDM group whose ordering was inconsistent, the relative position of the groups on each measure was consistent with the hypothesized continuum. Furthermore, the observed changes over the first four months were consistent with the notion that group differences would gradually diminish over time.

2. Floor Play

The only prior comparison of preterm and full term infants and their parents during play was that of Field (1977) who worked with younger infants in a face-to-face social play setting. In that study, preterm infants were less attentive to their mothers and their mothers were more active than was the case for full term dyads. Thus on the basis of Field's report, we expected to find that the infants in the preterm groups would be less attentive to both toy and social play and that their parents would be more active than those in the full-term group. Group x Age x Session analyses of variance were applied to measures of behavior frequency.

a. Preliminary t-tests indicated that there were no significant sex differences on any of the variables at 8 months of age. At 12 months, the only sex difference was that female infants handed toys to their parents more often than male infants in both the home and laboratory sessions.

b. The most striking feature of these sessions was that while no play sessions for full term or healthy preterm infants had to be terminated for infant distress, 7 such sessions occurred in the remaining two

groups. At the 8-month observations, 6 laboratory sessions (4 in the SP group, 2 in the IDM group) and 1 home session (in the IDM group) had to be terminated early. At the 12 month observations, the early termination occurred for a sick preterm infant at a home visit.

c. All behaviors for which there were significant group differences showed a consistent pattern of group differences at 8 months which diminished and were no longer significant at 12 months. Furthermore, the full term group showed little change from the 8- to the 12-month sessions while the remaining groups changed in ways that made their behavior more similar to that of the full term group. Behaviors which showed this pattern were infant play, fret/cry, and smile, proximity, parent-infant contact, parent touch, and parent demonstrate toy. At 8 months, the full term infants spent the most time in play and smiling and the least time fretting of all four groups. Their parents were also least active of all four groups. In contrast, the sick preterm infants spent the least time in play and smiling and the most time fretting while their parents spent the most time being close, touching, and demonstrating toys.

d. Because it seemed possible that the irritability and distress of the sick preterm infants may have been related to an inability to manipulate objects as a consequence of their developmental immaturity, a second full term control group was included in the 8-month assessments. This group was constituted by matching each sick preterm infant with a full term infant of the same sex and same post-conception age. No infant in this group was irritable or distressed to a point which required termination of either home or laboratory sessions. In the laboratory, some of the excessive fussing of the preterm group may be accounted for by the fact that the developmental assessments (which preceded the play

session) were of longer duration in the preterm group. However, the sick preterm group fussed more than the age-matched controls at home as well. Thus immaturity alone, or a more stressful developmental assessment does not account for the fussing of the sick preterm group.

e. The play sessions for the healthy preterm infants were most like those of the full term infants while those of the IDM group most resembled those of the sick preterm group.

f. There were no significant group differences at the 12-month sessions.

Thus, our predictions concerning group differences in play behavior were generally confirmed. The groups again generally ordered themselves as predicted with the infants of diabetic mothers occupying a less extreme position than the sick preterm group. Again the initial differences diminish over time seeming to support the general consensus that such differences decrease over time and are non-existent by the end of the first year. However, when we examine the overall pattern of group differences this view is not unequivocally supported. Although initial differences in feeding interactions have diminished by 4 months of age, assessments at 8 months in the floor play situation indicate highly significant differences which again seem to diminish. Thus, we have observed group differences in parent-infant interaction in the neonatal period and 8 months but not at 4 and 12 months.

B. Infant-Experimenter Interaction

At each age, in addition to the interaction observations, we included a separate behavioral assessment of the infant. In the neonatal period we used the Brazelton Scales (Brazelton, 1973) because they appeared to include behaviors which would be relevant to parent concerns. At 4, 8, and 12 months

we did not have a comparable instrument for evaluating infants' potential interactive skills. At these ages we used the Bayley Scales of Infant Development (Bayley, 1969) to assess more general aspects of infant development. While both of these assessments are generally considered to be assessments of the infant, each depends upon interactions with the examiner (with or without objects). For the Brazelton examination, many scores depend upon the examiner's judgment of how easy or difficult it was to engage the baby in a task and how socially responsive or unresponsive the baby was. The Bayley Scales include a section of ratings (the Infant Behavior Record) which is primarily concerned with the ease or difficulty of administering the assessment and the characteristics of the infant which contribute to these judgments. Thus while we can consider both of these instruments as assessments of the baby, we can also view them as indications of the infant's behavior with a relative stranger. Therefore an examination of group differences on the Brazelton Scales and the Bayley Behavior record can provide some indication of whether the findings for parent-infant interaction reflect group interaction differences restricted exclusively to parents or whether they are more generally applicable to social relationships with adults.

The Brazelton Scales were administered in the hospital prior to discharge and again at the 10-day home visit. The procedures followed those of the manual and the examiners had been trained to .95 reliability. The Bayley Scales were administered at each laboratory visit. Two members of the research staff were present at each assessment. The first interacted with the infant and parent(s) while the second scored and made sure all relevant items were administered. The Behavior Record was scored immediately after the assessment with the two observers reaching a consensus for each scale.

1. Neonatal Period

Because the preterm infants were less mature and had been physiologically stressed we expected that they would be more difficult for us to interact with than full term infants. Again we predicted that the full term group would obtain optimal scores followed by the HP, SP and IDM groups in that order. The Brazelton Scales yield 21 scores for reflex behaviors and 27 behavior ratings on a 9-point scale. In order to reduce the likelihood of chance significant findings, the following strategy for analysis was adopted. Infants were scored on four a priori clusters recommended by Brazelton and his colleagues (Adamson, Als, Tronick & Brazelton, 1975). Individual items within clusters were examined for group differences only for clusters which showed group differences. In addition because both parents and experimenters spontaneously commented about the absence of crying among sick preterm infants, all items involving crying were examined regardless of their cluster location. Individual items were subjected to a Group x Session (hospital vs. home) analysis of variance. The findings can be summarized as follows:

1. Items which differentiated the groups at both sessions included 4 items from the interactive cluster (resonse to ball, rattle, face and voice, and alertness), 2 motor items (hand-mouth coordination and pull to sit) and 4 items involving crying (peak excitement, rapidity of buildup, irritability, and state lability).

2. On interactive and motor items the full term infants consistently obtained the most optimal scores while the sick preterm group obtained the poorest scores (with the exception of pull to sit where the IDM group was poorest).

3. At the hospital assessment, the full term infants reached higher

states of arousal, reached their peak states more rapidly, cried more often and had more state changes than the remaining groups while the SP group consistently scored at the opposite extreme (had the lowest peak arousal states, took longer to reach these peak states, cried least of all groups and had the fewest state changes).

4. From the first to the second assessment full term and IDM babies became more alert while the healthy and sick preterm babies showed no change. In addition the full term babies were significantly less irritable (cried less often) at the second session while all other groups became more irritable.

In general, with the exception of the IDM group showing generally better performance than expected, the ordering of groups was as predicted. We had most difficulty getting and keeping the sick preterm group alert and responsive and least difficulty with the full term group. In evaluating the data for items involving crying, it is important to note that although most parents think they would like a baby who doesn't cry, crying is an important attention-getting signal for the neonate. The sick preterm infants' scores on peak excitement, rapidity of buildup, irritability, and state lability reflects not only that they cried very little but that they also spent little time in awake alert states with us. They were difficult to rouse and tolerated a great deal of mildly aversive stimulation without signaling distress or discomfort.

2. At Later Developmental Assessments

As with other interactive assessments we expected that those groups considered to be at greater risk for interactive difficulty would in fact be more difficult to work with in the testing situation. Thus, it was predicted that the FT group would receive optimal ratings followed by the HP, SP, and IDM groups. It is important to note that although all of the

prior data may have been influenced by the expectations of the experimenter, the ratings on the behavior record may be most subject to this bias. Although we had not originally planned to use these for analysis, but mainly to evaluate the adequacy of the assessment, we had different expectations concerning performance on the assessment for infants in different groups and may have behaved accordingly.

The Bayley Behavior record also yields a large number of ratings. In order to reduce the likelihood of accidental chance findings, we chose three types of items: those that seemed to be most clearly social (e.g. cooperativeness, response to examiner), those reflecting responses to test materials (e.g. attention span, persistence), and those reflecting temperament and emotional expression (e.g. emotional tone, endurance). Scores for each of these were subjected to a Group x Age analysis of variance.

The findings can be summarized as follows:

a. Items which showed a significant main effect for groups were responsivity to objects, goal directedness, attention span, reactivity, and manipulation of objects. Followup comparisons indicated that these differences were most often accounted for by full term infants obtaining the best scores with the sick preterm group obtaining the poorest scores.

b. Most of these items showed significant changes over age with the preterm groups showing significant improvement in scores with increasing maturity while the full term group showed little change over time. On two items, attention span and reactivity, there were no age changes or group x age interactions indicating that regardless of the age of testing, the ordering of groups remained the same: full term infants obtaining the best scores, sick preterm groups obtaining the poorest scores, and the remaining groups occupying an intermediate position.

c. Preliminary comparison of the age-matched controls and the sick preterm group at 8 months suggested that the preterm group spent more time in visual exploration and less time manipulating objects than the controls. Thus, differences between the sick preterm group and their post-natal age mates on most of the rating scales seems likely to be a function of immaturity. However, in comparison with the age matched controls, we spent more time in administering the Bayley Scales to the sick preterm group.

d. There was also some evidence that the same infants were consistently rated as difficult to work with. Those infants who received poor interactive scores on the neonatal assessment were later rated less cooperative, more negative in emotional tone, poorer in endurance, and less responsive to tasks during the Bayley assessment.

III. Discussion

The primary purpose of this study was to examine differences among four groups expected to differ as a consequence of stresses arising from newborn medical problems. Our sample, from a teaching hospital in a major medical center, consisted primarily of white middleclass families receiving good medical care. Thus, many of the problems ordinarily present as correlates of prematurity were absent in this sample and can be ruled out as confounding stresses on the parent-child relationship. In addition hospital support for parent-infant attachment was more comprehensive than in most previously reported studies and early parent-infant contact was more extensive and regular than in studies reported earlier. All of these factors could be expected to minimize the predicted group differences.

Nevertheless, many of the predicted differences were observed and our findings are consistent with those of preterms in vastly different less

advantaged samples (e.g. Brown & Bakeman, in press). Furthermore, with the exception of the IDM group which was consistently less stressed than expected, the remaining groups were consistently ordered as predicted with the full term group and the sick preterm group occupying the extreme positions and the healthy preterm group an intermediate position. Thus there is some support for a dimension of interactive stress related to severity of medical problems.

At the early feedings parents of full term infants touched, cuddled and talked to their babies more than parents of preterm infants. Although physical contact with the preterm infants showed some increase over time, it remained below that initially given to full term infants. Thus initial contacts were not only delayed but depressed. Although these group differences were similar in pattern at 4 months, they were no longer large enough to be statistically significant. On the basis of these feeding observations, it would seem that the group differences are diminishing with time. Indeed, this is what the few existing prior studies report (Brown & Bakeman, in press; Leifer, Leiderman, Barnett & Williams, 1972). However, at 8 months, in the free play situation, even more striking differences were observed. Sick preterm infants played less, fussed more, and received more parental attention than the full term group. Comparison with an age-matched cross-sectional control group indicated that immaturity alone did not account for the excessive irritability. These differences are similar in quality to those noted by Field (1977) for similar groups in face to face social play at 3½ months and by Brown and Bakeman (in press) during early feedings. In all of these situations, parents of preterm infants were more active and invested more effort interacting with their infants with notably less success than parents of full term babies.

Similarly in our own ratings of developmental assessments we found the preterm infants were less responsive to the materials and tasks and were more difficult to test. Thus, the extra effort required to engage these babies in a task seems to extend across a variety of situations and occurred with experienced professional "baby handlers" as well as parents. At 12 months, differences in the free play situation were no longer evident again suggesting that the groups become more similar over time. In behavior ratings on the developmental assessments many of the group differences did decrease with time. However the preterm infants continued to be rated less attentive and responsive than the full term group at 12 months of age. Comparison with the age matched controls at 8 months indicates that relative immaturity accounts for some but not all of the observed group differences. In general, the 12 month data show fewer group differences than the 8-month data and one is again tempted to conclude that the group differences diminish with age and will eventually disappear.

The fact remains that the most dramatic differences in our study appeared at 8 months. Were it not for these differences, the conclusion that the groups consistently become more similar in their interactions with time, would be warranted. It is therefore necessary to seek explanations for the "see-saw" pattern of increasing and decreasing group differences that have been observed. The remainder of this chapter discusses alternative interpretations of this phenomenon.

1. The 8-month differences may represent a temporary perturbation in a pattern of decreasing differences. One reason for this perturbation may be developmental. Developmental data from several studies of preterm infants (Hunt, 1975; Field, Hallock, Ting, Dempsey, Dabiri & Shuman, 1978) including our own indicate that at 8-month assessments preterm infants

appear to lag further behind their full term counterparts than they do at earlier or later ages. Our observations suggested to us that this may be an artifact of the number of items on standardized infant tests that require sensorimotor skills in this age range. Few of our sick preterm infants were able to sit well and manipulate objects at their 8-month assessments. Therefore a large number of supposedly appropriate items could not be administered.

If we consider this from the parent's standpoint, it is also apparent to them that their babies are not doing the things that they expect them to or that they see other babies doing. While they may be prepared for some delay related to prematurity, they may also become particularly anxious about the infant's development during this period of maximal lag. If this is so they may, in fact, be pressing the infant to "perform" during play at a level beyond his/her capacity, producing the unhappy play sessions we observed. By 12 months when the sick preterm group seems to have "caught-up" developmentally, particularly in motor skills, some of this anxiety may have abated, allowing for more relaxed play.

2. The 8-month differences may be an artifact of introducing a new observation situation. Our reason for choosing two different interactive situations was that we wished to observe parent-infant interactions under conditions that were representative and salient for each age period. Feeding, we argued, was an important caregiving situation in the early months, but would be less salient at older ages. Free play, we thought, would be more representative of typical interactions at 8- and 12-months. However, it may be that with each new situation, the stress of being observed is activated or reactivated. It may be that underlying group differences become more evident under stress. Therefore, we observed

differences in the neonatal period and at 8 months when we introduced a new procedure, but not at 4 and 12 months when the observation situation is more familiar. At both 4 and 8 months the laboratory (2nd) session was characterized by more signs of stress, including fretting, than the home (1st) session. Therefore such an explanation would have to be qualified by home versus laboratory differences.

3. The major differences between groups may be in the ease with which they adapt to new developmental stages. Although most preterm dyads eventually establish a harmonious relationship, they may take longer to make a successful adaptation. Thus group differences are maximal when initial adaptations are being made (in feeding, floor play, separations) and will be less evident in these same activities at a later time. This suggests that our reasoning about choosing salient situations was essentially correct. However, while we appropriately chose situations that were salient in the newborn and 8-month periods, other situations would have been more appropriate at 4 and 12 months. For example, Field's (1977) data on face to face play at 3½-4 months (considered to be a peak period for such play) suggest that it might be more revealing of group differences at this age than a feeding observation.

A review of other studies of parent-infant interaction among preterm dyads reveals the paucity of interactive data for infants older than 4 months of age. In addition to our own study, Beckwith and her colleagues (Beckwith, Cohen, Kopp, Parmelee & Marcy, 1976) did home observations of a large sample of preterm dyads at 8 months. This particular study was not concerned with comparisons between preterm and full term dyads. A longitudinal study from Stanford University (Leiderman & Seashore, 1975) reported only differences in parents' smiling behavior. It may well be

that little has been reported because investigators who did not find group differences have not published reports of their studies. However, with this data base there is little basis for deciding how long interactive differences between full term and preterm dyads persist.

IV. Summary: Difficulties of Caring for the Preterm Infant

It has often been suggested that separation of parent and infant in the newborn period deprives parents of opportunities for interaction during a sensitive period for maternal attachment (Klaus & Kennell, 1976). Subsequent interactive difficulties are interpreted as consequences of separation. Although the effects of separation may contribute to interactive difficulties, the data presented above indicate that the preterm infant may also be more difficult to care for than the full term infant.

First, at hospital discharge, the behavior of the preterm infant is not as well adapted to normal caregiving as that of the full term infant. S/he is not alert and responsive to caregivers and is unable to provide clear distress signals by crying when attention is needed. While the pediatrician or psychologist may explain these differences in terms of underlying differences in maturity, parents must cope with the behavior that confronts them regardless of the "cause".

Similarly parents of preterm infants are denied the gratifications of positive signs of growth and development (e.g. social smiles, new motor skills) for a relatively long period of time, even where development of their infant is normal. While parents may understand the reasons for such delays in terms of the baby's post-conception age, their early rewards are quite meager.

It appears that preterm infants continue throughout the first few

months to present somewhat problematic interactive behavior both to parents and others. Whether in feedings, face to face play, or object play, the adult partner appears to put more effort into the endeavor than the full-term infant requires. While it is not clear how long such differences exist, the findings from most available studies are consistent on the nature of these differences.

The infant-caregiver relationship can be viewed as an adaptive species-specific system of interlocking behaviors. The initial repertoires of infant and caregiver are preadapted to facilitate social interaction and any limitations or handicaps in the behaviors of one member of the dyad requires compensatory efforts on the part of the partner if the system is to be maintained. The birth of a premature infant appears to confront the caregiver with a poorly adapted social partner. Therefore it is not surprising that the development of social interactions in this group should follow a different course than that of full term infants.

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Table I

Sample Characteristics

Group	Sex	Initial Feeding Method	$\bar{X}$ Gestational Age in Weeks	$\bar{X}$ Birth Weight (grams)	$\bar{X}$ 1 min Apgar	$\bar{X}$ 5 min Apgar	$\bar{X}$ Days in Hospital	Morbidity Index
Full-Term Normal (FT)	5 M 5 F	4 Breast 6 Bottle	39.5	3260	8.6	9.3	3.5	9.8
Healthy Prematures (HP)	6 M 4F	5 Breast 5 Bottle	34.8	1928	7.1	8.7	13.2	42.2
Sick Premature (SP)	5 M 5 F	4 Breast 6 Bottle	30.3	1531 (879-2438)	6.4	7.6	34.6	60.3
Infants of Diabetic Mothers (IDM)	2 M 8 F	3 Breast 7 Bottle	36.6	3232 (1417-3941)	6.1	8.2	11.7	64.3

Adapted from DiVitto & Goldberg (1979) Effects of Neonatal Status on Early Parent-Infant Interaction, in INFANTS BORN AT RISK: BEHAVIOR AND DEVELOPMENT, Field, Sostek, Goldberg & Shuman, eds., Spectrum Publications, New York, 1979.

Table II

Mean Age of Achieving Developmental Milestones

	Group							
	FT		HP		SP		IDM	
Behavior	$\bar{X}$	Range	$\bar{X}$	Range	$\bar{X}$	Range	$\bar{X}$	Range
Smile (weeks)	5.0	3-8	8.2	0-13[a]	13.8	0-20[a]	6.9	1-12
Sleep all night (weeks)	8.2	4-10	11.5	3-18	13.7	8-?[b]	11.7	1½-?[b]
Turn front to back (months	4.0	2-7½	3.6	½-3½	5.7	3-8	4.1	5-7
Turn back to front (months)	4.2	2½-7½	5.3	3½-7½	6.6	3-9	4.5	½-7½
Tranfer objects hand to hand (months)	4.8	3½-6	6.3	5-7½	7.4	5½-10	5.7	3½-9½
Sit (months)	6.5	4-8	8.1	6-9	8.4	7-10	7.6	5-10
Pincer grasp (months)	7.9	7-10	10.4	7½-?[c]	9.8	8-?[c]	9.2	8-?[c]
Walk	11.5	10-13	—[d]		—[d]		—[d]	

[a]One mother in HP group and one in SP reported smiling from birth. These mothers probably treated reflex smiles as social smiles.

[b]2 SP infants, 1 IDM infant not sleeping all night by 12 months. Means based on remaining infants.

[c]1 HP infant, 2 SP and 1 IDM infant not showing pincer grasp at 1 year. Means based on remaining infants.

[d]No HP or SP infants walking at 1 yr. Four IDM infants walking.